City and County of Honolulu

Department of Environmental Services

Refuse Division – H-POWER and Disposal Branches



# H-POWER's Role in Diverting Trash from Landfills











# Speaker Bios



## Ahmad Sadri, P.E.

- Energy Recovery Administrator City
- Licensed Professional Engineer in the State of Hawaii (2011)
- 14 years work experience in Integrated Solid Waste Management including planning, permitting, engineering, wasteto-energy, landfills and transfer stations
- Certified by SWANA as a Manager of Landfill Operations
- B.S. Civil Engineering (2005) and M.S. in Environmental Engineering (2007) both from North Carolina State University



## **Pieter Mathews**

- Project Controls Specialist HDR Engineering Inc.
- Consultant to the City of Honolulu for 13 years, tracking and evaluating financial and engineering performance of H-POWER and WGSL
- Managed Mid-Atlantic consulting and environmental remediation business unit
- B.S. Geology from Michigan State University (1980)

# "To err is to be human..."

## **Waste Generation**

- Trash: 4 lb per person per day
- Wastewater: 100 gallons per person per day
- Where does it go?
  - Out of sight out of mind?
  - Someone will come by and pick it up?
  - Flush it and forget it?
  - Dump 'em?

Integrated Solid Waste Management and Wastewater Treatment

# Oahu is not the Mainland!

**Mainland** 

**Source Reduction** 

Reuse, Recycle **Compost** 

> Waste to Energy

> > LF

**Oahu** 

**Source Reduction** 

**Food for Animals (piggeries)** 

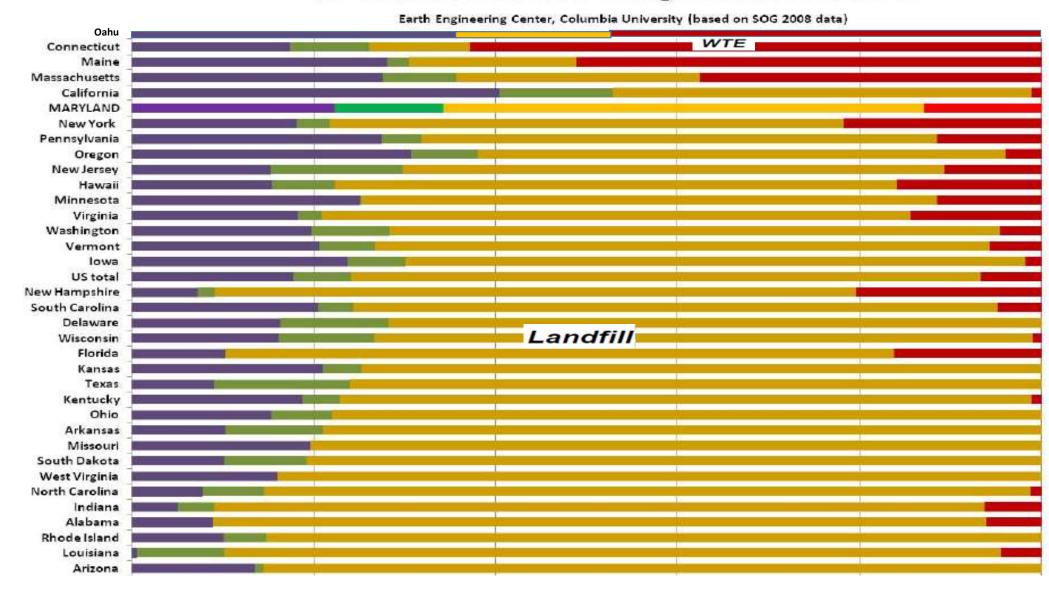
Reuse

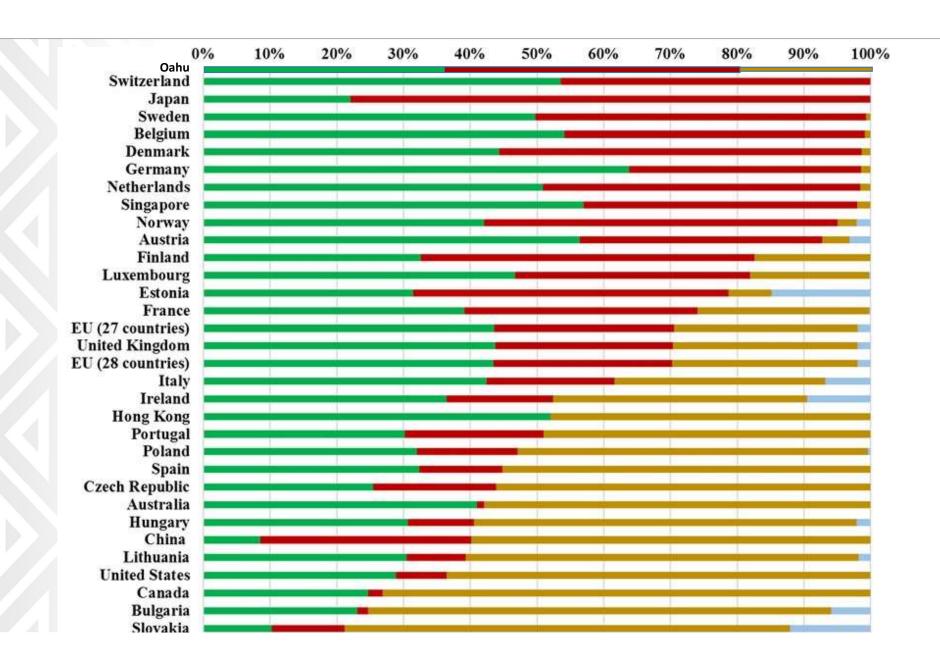
**Recycle Locally, Compost** 

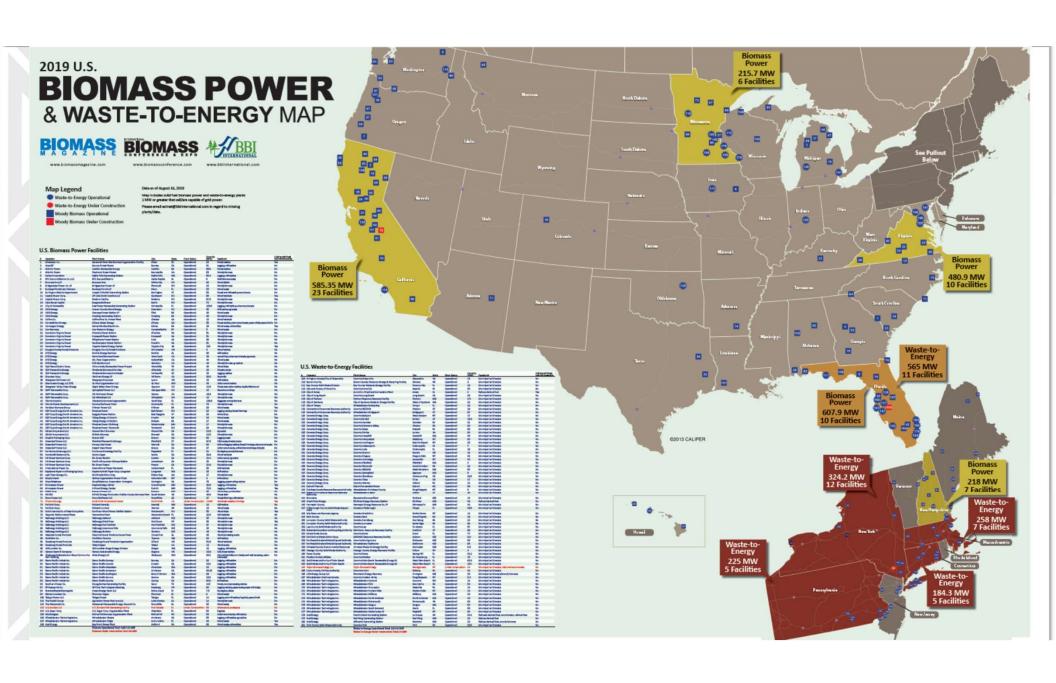
Ship to WTE Recycle

LF

#### The Sustainable Solid Waste Management Ladder for the US







# Where do we find WTE in America?

## Where?

- Northeast
- Pacific Northwest
- Minnesota, Wisconsin, Michigan
- Florida
- Oahu

Rest of South, Midwest, Mountain and California have very little WTE

## Why?

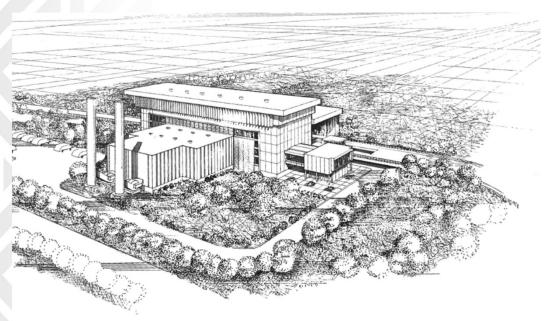
- High population
- High cost of land
- Space for landfills is limited
- High energy rates
- High tipping fees
- Heating needs

# Ahui St. Incinerator (1930)





# Depot Rd. - Waipahu Incinerator (1970)





METCALF & FOOT, INC. Boston, Massachusette AUSTIN, SMITH & ASSOCIATES, INC. Hannhule, Marwell

# Waste-to-Energy Myths

## H-POWER is NOT:

- Not a dump
- Not a landfill
- Not an incinerator
- Not a coal or diesel power plant
- Not competing with recycling
- Not losing money
- Not a mistake

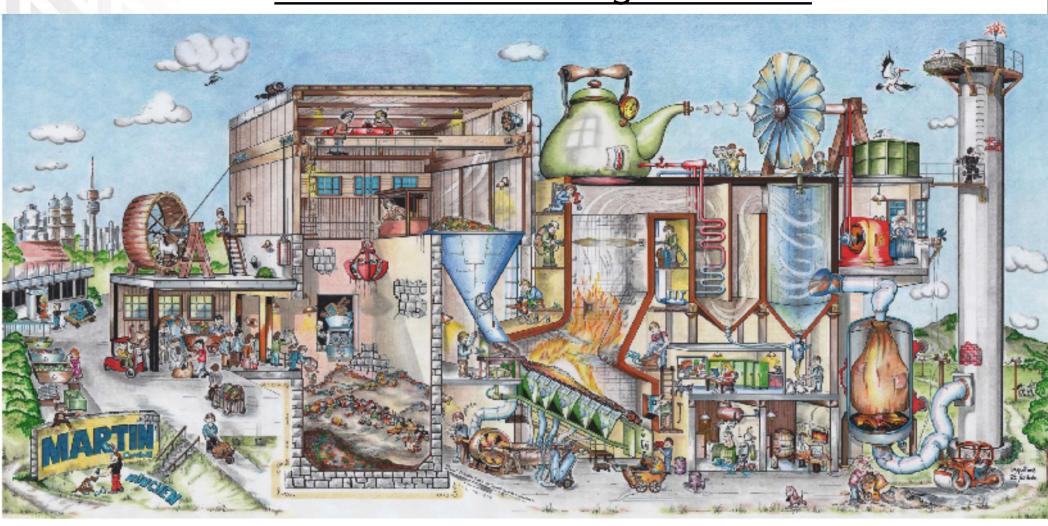
## **H-POWER** is:

- Is a great investment
- Is making net revenues for the City
- Is a great way to stabilize trash and reduce its volume
- Is renewable energy

# **Third Boiler Expansion**



# The Rube Goldberg Machine



# Sludge Receiving Bin





# Sludge Receiving Bin

- 90 tpd capacity (about 9 loads a day)
- Currently receiving 50 tpd
- 15-25% solids
- City, private, military WWTPs
  - Honouliuli
  - Kailua
  - Waianae
  - Sand Island (when Synagro down)
  - East Honolulu
  - Schofield Barracks
- Driver operates control panel





# 300-400 Trucks Daily

#### IN

- 50 tractor trailers (20 tons ea)
- 100 side loaders (8 tons ea)
- 100 other commercial (8 tons ea)
- 30 convenience ctr (4 tons ea)
- 10 nonprofit (5 tons ea)
- 5 sludge (10 tons ea)
- 1 tires (2 tons ea)

#### OUT

- 25 ash (15 tons ea)
- 5 residue (15 tons ea)
- 10 metals (10 tons ea)

Material	Gross Weight	Tare Weight	Net Weight
1 - C & C-OTHER	53.18	45.11	8.07
tickets and 5 transactions			
2 - CONVENIENCE CENTER	609.82	492.16	117.66
tickets and 31 transactions			
- ELEEMOSYNARY	152.47	111.13	41.34
ickets and 8 transactions			
- C & C-REFUSE TRUCKS ONLY tickets and 57 transactions	1,557.90	1,006.73	551.17
5 - STANDARD COMMERCIAL	4 125 02	2715 (0	1.440.24
4 tickets and 164 transactions	4,155.93	2,715.69	1,440.24
- TRANSFER LOADS	1.292.77	609.15	683.62
tickets and 33 transactions	1,272.77	007.13	003.02
- RESIDUE LANDFILL MATERIAL	147.37	79.85	67.52
ckets and 4 transactions			
- ASH TO LANDFILL (RDF)	315.36	176.54	138.82
ckets and 9 transactions			
- ASH TO LANDFILL (MBN) tickets and 14 transactions	485.56	312.16	173.40
- ENHANCED FERROUS	27.54	45.11	45.45
ckets and 3 transactions	91.56	46.11	42,42
2 - BAMR FERROUS (MBN)	160.08	102.10	57.98
ckets and 6 transactions	100.00	102.10	27.7.70
- SLUDGE - DEWATERED	60.51	33.19	27.32
kets and 2 transactions			
- Lime to RDF	74.64	32.57	42.07
kets and 2 transactions			
- LIME to MBN ket and 1 transaction	38.74	17.92	20.82
	9,195.89	5,780.41	3,415,48
port Grand Totals	9,195.89	2,780.41	3,413.48

339 tickets and 339 transactions

The daily tonnage	for Monday, 3/15/21:	
1167.56	MSW to MBN plant	
27.32	Sludge MBN plant	(0.00 tons Sludge Non-City
1674.54	MSW to RDF plant	
0.00	MSW to WAB plant	
2869 42	Total MSW received	

		03/15/21
4	C0C O4	
1	C&C Other	8.07
2	Convenience Center	117.66
3	Eleemosynary	41.34
4	C&C Refuse Trucks	551.17
5	Standard Commercial	1,440.24
6	Transfer Loads	683.62
52	Sludge loads	27.32
55	non city sludge 0.00	2,869.42

#### 1AutoClaveMedicalload(s):

5 Medical audit load(s):

22 Total Tires received

C&C Transfer Trailers brought in 33 loads [3 loads from Kawailoa, 16 loads from Keehi, 14 Loads from Kapaa]





## Scale House



Tipping Floor (RDF)

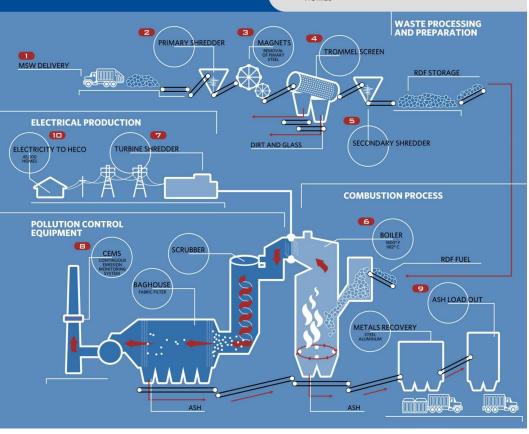


## STEP INSIDE THE HPOWER FACILITY AND YOU CAN FEEL THE ENERGY.

HERE, 24 HOURS A DAY, 365 DAYS A YEAR, ORDINARY HOUSEHOLD GARBAGE IS CONVERTED INTO ENVIRONMENTALLY SOUND, RENEWABLE ELECTRICITY THAT POWERS THOUSANDS OF OAHU HOUSEHOLDS. IN THE PROCESS, PRECIOUS LANDFILL SPACE IS PRESERVED, 800,000 BARRELS OF IMPORTED OIL PER YEAR ARE SAVED, AND THE BEAUTY OF OUR ISLAND HOME IS PROTECTED.

#### THE HPOWER PROCESS: (MATCHES UP TO NUMBERS ON DIAGRAM)

- TRUCKS DELIVER MUNICIPAL SOLID WASTE
- PRIMARY SHREDDERS OPEN AND SPREAD WASTE
- ELECTROMAGNETS REMOVE METALS FOR RECYCLING
- SCREENS REMOVE DIRT, SAND AND GLASS
- **(5)** SECONDARY SHREDDER PROCESSES REMAINING WASTE
- WASTE IS COMBUSTED IN BOILER PRODUCING STEAM
- 7 STEAM DRIVES TURBINE TO GENERATE ELECTRICITY
- AIR POLLUTION CONTROL EQUIPMENT CLEANS EXHAUST GAS
- ASH IS HAULED TO LANDFILL FOR DISPOSAL
- RENEWABLE ELECTRICITY POWERS 45,000 HAWAII HOMES









RDF Storage

## **Unit 3 Pit and Crane**





**Unit 3 Crane Operation** 

# Viewport into Boiler

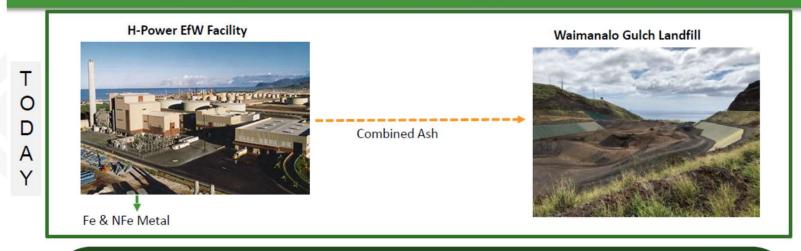




Combustion



## City of Honolulu Ash Processing & Recycling Facility Metals Recovery (Today) and Total Ash Processing (Tomorrow)





# H-POWER- a Success Story

## **Financial**

- Both H-POWER 1990 (RDF) and 2012 (Unit 3) were completed on time and on budget
- \$10-15M net revenues annually
- \$257M total net revenues from 1990-2020
- Almost \$1 Billion saved compared to landfilling and counting
- H-POWER provides a valuable service and makes a net profit for the City

## **Technical**

- Volume of trash reduced by 90% (weight by 75%)
- Stabilizes trash (converts to inert ash)
- Reduces oil imports: one ton trash produces same amount of electricity as one drum oil
- Generates up to 10% of Oahu's electricity needs – 73 MW or 65,000 homes
- Recovers metals not captured by recycling programs

# Without H-POWER

## **More Landfills**

- 17M cu yd trash diverted 1990-2020. Where would it go?
  - Enough to fill two landfills the size of WGSL (400 acres)
  - \$650M additional landfill costs from 1990-2020
  - Post closure care for landfills extends forever, not 30 years

## **More Imported Oil & GHG Emissions**

- Reduced about 19M drums of imported oil for electricity generation
- Reduced about 19M tons GHG CO2E compared to landfilling

# Capital Purchase of H-POWER

#### **Financial Impact to City**

•	<b>Construction Costs</b>	(Completed 1990)	-\$185 M
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Sale, lease, bought back Ford Motor (1991-2008) +\$ 86 M

Other Net Operating Revenue (1991-2008) +\$112 M

**TOTAL NET PROFIT (1991-2008)** 

+\$13 M

# H-POWER- Current Operating Financials

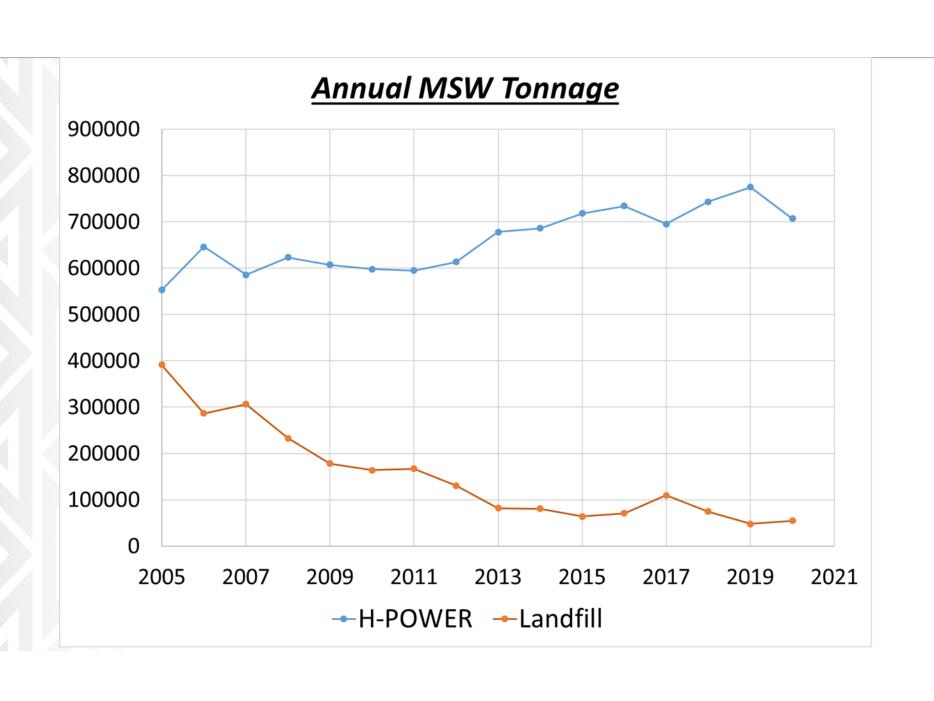
## **Costs**

- \$70M service fee
- \$28M debt service
- \$6M CASE
- \$4M CIP projects, refurbishment and rolling stock
- About \$108M annual gross costs

## Revenues

- \$52M Tip fees
- \$70M HECO electrical
- \$1M Metals recycling
- About \$123M annual gross revenues

**\$15M ANNUAL NET REVENUES** 

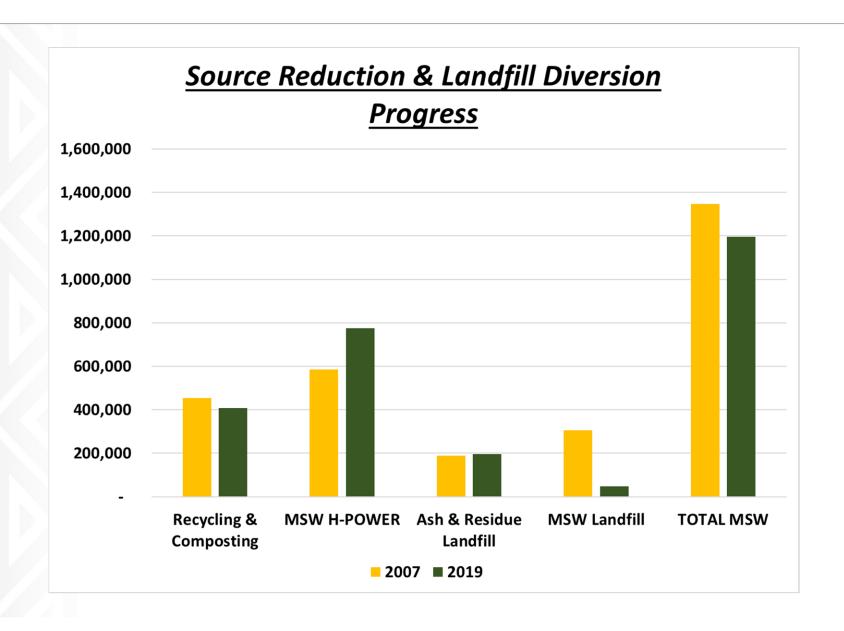


# Landfill MSW Down 85% since 2007

- Economic recession 2008
- Since 2012 diverted:
  - Bulky items
  - City tires
  - Sludge
  - Petroleum contaminated soils
  - Expired food waste
  - Treated medical waste

## **Landfill Still Needed For:**

- H-POWER ash and residue (200,000 tpy)
- ASR (35,000 tpy)
- WWTP grit/bar screenings (1,000 tpy)
- Public with rock, dirt, concrete (300/mo)
- Dead animals
- HECO/refinery sludges
- ACM (5,000 tpy) as of Jan 1, 2021
- C&D waste diverted from PVT Landfill (future)
- Disaster Debris



# "Moving the Needle"

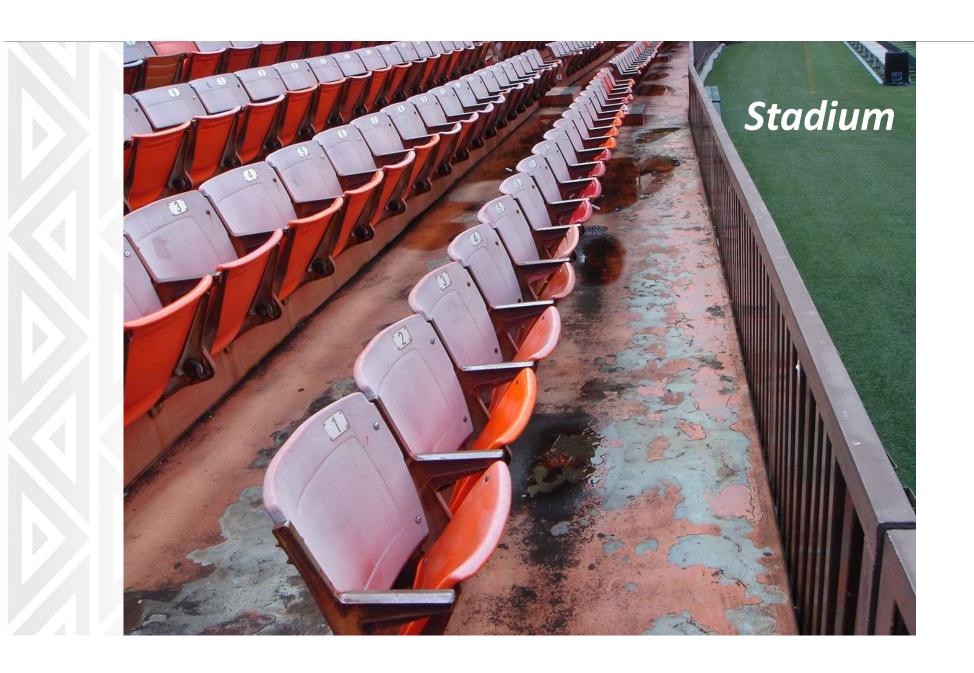
- MSW tonnage is a leading indicator of the economy
- 2007 (before recession) vs. 2019 (before COVID-19)
- Trends:
  - 10% reduction in overall MSW (measure of source reduction)
  - 85% reduction in MSW landfilled (measure of landfill diversion)
  - LF diversion rate increased from 63% to 82%

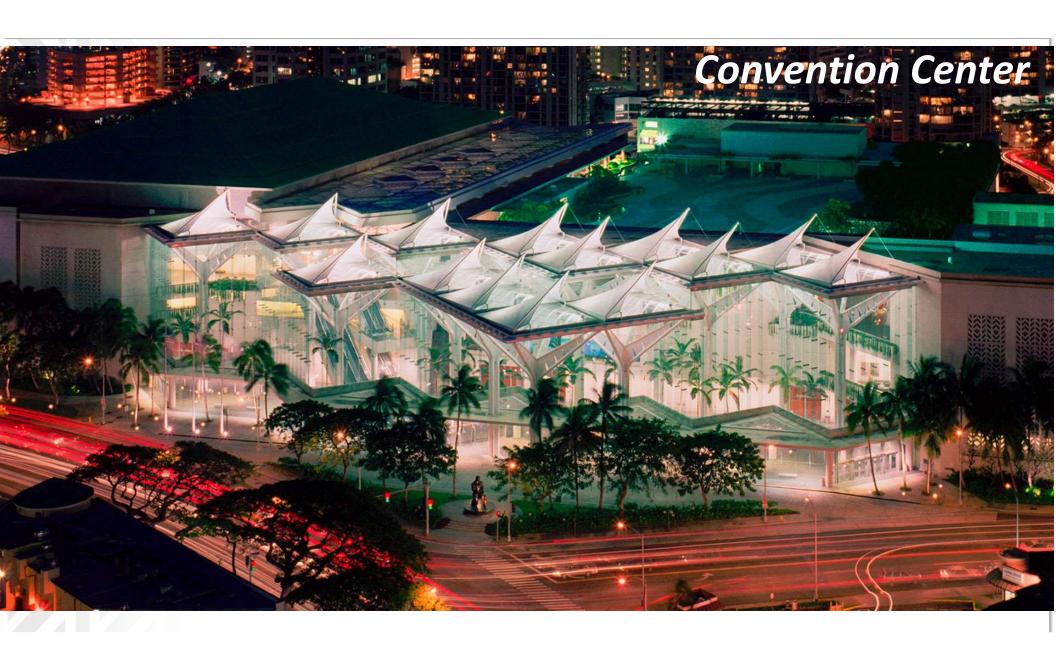
Tonnage reduced after economic recession and after pandemic. Is this good? Bad? Why?













# Observations, Contemplations, Marinations

- Most successful public works project in Hawaii's history?
- 2. Why do we need a landfill?
- 3. How to we define and measure success?

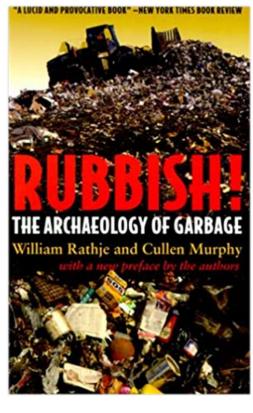
# "The Mind Rebels at Stagnation"

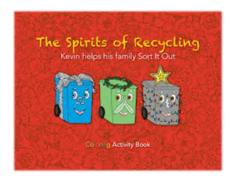
#### - Sherlock Holmes















Co. DRING ACTIVITY BOOK

#### The Opala IQ Book



The Opale 10 Book

# References

#### **Opala.org**

- 2008 H-POWER Expansion EIS
- 2008 Waimanalo Gulch Landfill Expansion EIS
- 2012 Mayor's Advisory Committee on Landfill Site Selection (MACLSS)
- 2017 Assessment of Municipal Solid Waste Handling Requirements
- 2019 Integrated Solid Waste Management Plan

#### More

- 2009 Linking Waste and Material Flows on Oahu (Yale University)
- SROI Sustainable Return on Investment (HDR Engineering Inc.)
- Biomass Magazine
- Columbia University Earth Engineering Center
- Covanta Energy Inc.
- Environmental Protection Agency (EPA)
- Greenpeace
- Solid Waste Association of North America (SWANA)



